Information Bulletin

Grade 9 Science 1997-98

Alberta
EDUCATION

This document was written primarily for:

Students	✓
Teachers	✓ Grade 9 Teachers
Administrators	✓
Parents	
General Audience	
Others (Specify)	✓ Superintendents

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This bulletin contains general information about the Achievement Testing Program and information specific to the Grade 9 Science Achievement Test. **It replaces all previous bulletins.**

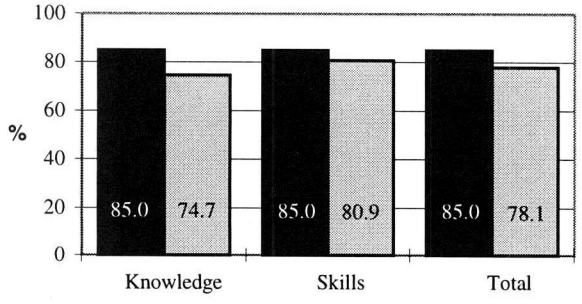
September 1997

Contents

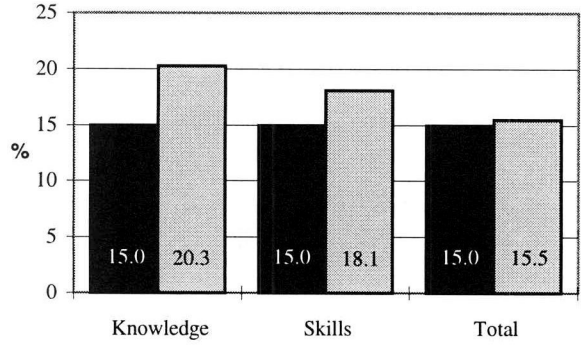
Looking Back: Highlights of 1997

This information provides teachers, school administrators, and the public with an overview of the results for the June 1997 Grade 9 Science provincial assessment. It complements the detailed school and jurisdiction reports.

Acceptable Standard



Standard of Excellence



Achievement Standards*

Actual Results**

*the percentage of students in the province expected to meet the acceptable standard and the standard of excellence

**the percentage of students in the province who met the standards (based on those who wrote)

Who Wrote the Test?

All students registered in Grade 9 were expected to write the 1997 Science test. A total of 35 191 students completed the test in English. In 1997, only a small proportion of students in Grade 9 did not write the test: 4.2% of students were absent and 4.1% of students were excused from writing by their superintendent.

What Was the Test Like?

The test had 50 multiple-choice questions and 5 numerical-response questions in six topic areas: Diversity of Living Things, Heat Energy: Transfer and Conservation, Fluids and Pressure, Electromagnetic Systems, Chemical Properties and Changes, and Environmental Quality. Two learning domains were assessed: Knowledge (19 questions) and Skills (36 questions). Students recorded their responses to questions on a separate answer sheet.

How Well Did Students Do?

As shown by the graphs, the number of students meeting the *acceptable standard* was below expectations. This is discouraging, particularly on the knowledge component of the test, where only 74.7% of students were able to meet the *acceptable standard*. However, the number of students achieving the *standard of excellence* was higher than expected in both the knowledge and skills components of the test.

In 4.1% of the schools, the percentage of students meeting the *acceptable standard* was significantly above expectations for the province. In 60.4% of the schools, the percentage was not significantly different from provincial expectations. In 35.4% of schools, the percentage of students meeting the

acceptable standard was significantly below provincial expectations. Schools where fewer than five students wrote the Grade 9 test are not included in these school calculations.

The results presented in this material are based on scores achieved by all students except those who wrote the French translation of the test. Results for these students are reported separately.

Has Achievement Changed Since Last Year?

A comparison of the results on the common items appearing on both the 1996 and 1997 tests shows that student achievement has dropped slightly. In 1996, the provincial average on the 25 common items was 16.6. In 1997, the provincial average on the 25 common items was 16.2.

Commentary and Sample Questions from the Grade 9 Science Achievement Test 1997

The Grade 9 teachers who reviewed the assessment felt that it adequately covered both concepts and process skills in all six units, that it was a good reflection of the science program, and that the emphasis on the test reflects what is being taught in most classrooms. The majority of teachers believe that the test had a good range of comprehension questions with an excellent representation of all the areas of the program. Some of the teachers felt that the assessment would be more meaningful if more emphasis could be placed on providing a real-life context where students would take on a role in the question. Teachers continue to agree that numerical-response questions can provide more relevant information about what students can do with what they know in science. The use of the numerical-response format, with clear directions for students, will continue. Many teachers indicated that the achievement test continues to assist them in the clarification of the curriculum standards for the Grade 9 Science course.

The following questions are no longer secured. Sample questions from the assessment and accompanying discussion are provided to highlight the knowledge and skills demonstrated by students achieving the *acceptable standard* and the *standard of excellence*. For each sample question, there is an asterisk beside the correct answer.

Acceptable Standard

Overall, results show that most students who met the *acceptable standard* but not the *standard of excellence* were able to

- identify factors that affect the viscosity of fluids
- recognize the relationship between gravity and buoyancy
- distinguish components of waste products that are transported by water
- recognize the relationship between the density of objects and buoyancy
- recognize evidence of chemical change in materials
- infer abiotic factors that affect living things in an environment
- infer variations in the structural adaptation of living things
- infer environmental conditions that a particular organism adapts
- recognize the consequences of environmental changes due to human actions

Use the following information to answer question 21.

> The researchers from the trout farm conducted an ecological study of a local river that the fertilizer plant used. Results showed that no fingerling (young) trout were found downstream from the plant. However, the number of large trout downstream was about the same as the number upstream.

21. It is **most likely** that the plant wastes

- **A.** decreased the death rate of fingerling trout
- **B.** had no effect on trout growth
- **C.** lowered the temperature of the river
- ***D.** affected the birth rate of fingerling trout

In **question 21**, students were required to read and interpret the information presented. Students had to apply their knowledge and understanding of an ecological study of a river and the impact that wastes from a fertilizer plant would most likely have on the fingerling trout. Of the students achieving the *acceptable standard* but not the *standard of excellence*, 86.4% answered the question correctly. Although for some students, the answer may be obvious and one of recall, all students were provided enough information to assist them to formulate correct inferences

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Many students achieving the *acceptable standard* but not the *standard of excellence* experienced difficulty in correctly answering questions that required them to

- interpret data to identify a suitable environment for a particular living thing
- recognize the effects on reaction rates as a result of changing particle size
- identify the function of the components for active solar heating
- interpret information from a chart related to specific heat capacity
- determine the density of material using mass and volume
- distinguish between manipulated, responding, and controlled variables
- identify the compressibility of gases in terms of particle theory
- infer, from observations, the diversity among living things
- order taxonomic levels of the Linnaean classification system
- determine the force exerted on an increased surface area
- calculate density of a material based on mass and volume displacement

Use the following information to answer question 35.

As part of an analysis on a gold nugget, Mai Lee found that the nugget had a mass of 579 g and a volume of 30 cm^3. From reference sources, she found that

- pure gold has a density of 19.3 g/cm^3
- pure gold sells for $25.00 per gram

35. From her investigation, Mai Lee determined that

A. the nugget is pure gold and contains less than $14 000.00 worth of gold
***B.** the nugget is pure gold and contains more than $14 000.00 worth of gold
C. the nugget is not pure gold
D. she needed more information

In **question 35**, students were required to read and interpret information presented in text and in numerical form. Students had to understand the problem presented and recognize that they first had to determine whether or not the gold sample was pure or not. By performing a routine calculation to determine the density of the nugget, students needed to divide the mass (579 g) by the volume (30 cm^3). Next, students had to compare the density of the nugget to that of pure gold. In the final step, students had to multiply the mass of the pure gold by the selling price to determine the worth of the gold. Only 35.0% of students meeting the *acceptable standard* answered the question correctly. Many students continue to have difficulty, not in calculating the density of a substance, but transferring their knowledge to a real-life context where simple mathematics skills are required.

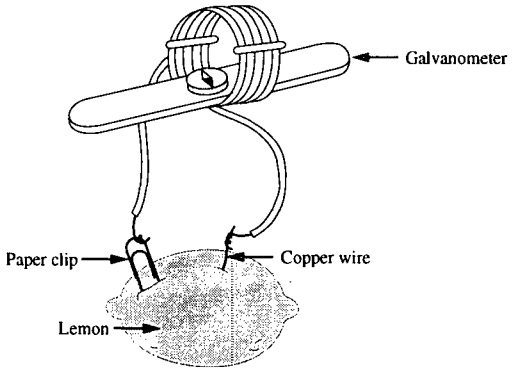
Standard of Excellence

Students who met the *standard of excellence* demonstrated greater success than did other students. In addition to the successes identified for students achieving the *acceptable standard*, many students achieving the *standard of excellence* could

- recognize an application of heat transfer by convection
- identify contributions of science for the protection of the environment
- recognize the word equation of a chemical reaction
- interpret graphs to infer the factors that affect rates of corrosion
- identify selective breeding as a mechanism to enhance desired characteristics
- interpret a graph to select pH levels suitable for an organism's survival
- interpret a chart of indicators to identify solutions as either acidic or basic
- interpret a chart and apply knowledge of acids and bases
- recognize the factors that affect the rate an object moves through a liquid

Use the following information to answer question 40.

To show Gerry that electricity can be produced from alternate sources, Amandeep set up the apparatus shown below. When the ends of the wire coil from the home-made galvanometer were attached to the paper clip and copper wire in the lemon, the compass needle was deflected for a short time.



40. The change in energy that occurred in this demonstration is

A. mechanical energy to electrical energy
B. mechanical energy to chemical energy
C. electrical energy to chemical energy
***D.** chemical energy to electrical energy

- evaluate alternatives regarding actions that affect the environment
- interpret information presented in charts and graphs
- identify a process of heat transfer as conduction
- know that a simple wet cell converts chemical energy into electrical energy
- infer a parallel circuit from a diagram using electrical symbols

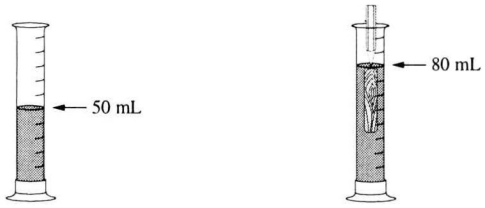
In **question 40**, students were required to know that a simple wet cell converts chemical energy into electric energy. Students may or may not have had the experience of either a hands-on activity or teacher demonstration of this conversion. In either case, students had to either make direct observations from the diagram or combine their observations with the explanation presented in the information box, to correctly identify the energy conversion presented in the demonstration. More than 98% of students achieving the *standard of excellence* were able to correctly identify the transfer of energy from chemical to electrical.

Many students achieving the *standard of excellence* experienced some difficulty in correctly answering questions that required them to

- interpret the relationship between variables from two graphs
- predict the effect of pollutants on the environment
- interpret data and determine correct experimental procedures

Use the following information to answer numerical-response question 5.

Shannon used displacement to calculate the density of a wooden dowel. The mass of the dowel was 15 g. The volume was calculated by submerging the dowel in a graduated cylinder containing 50 mL of water.



Numerical Response

5. The density of the wooden dowel, to the **nearest hundredth** or to **two decimal places**, is _____ g/cm^3.

In **numerical-response question 5**, students were required to read and interpret the information presented in the text and illustration provided. Students had to either recall their understanding of the water displacement method used for determining the volume of an irregularly shaped object, or determine the volume through the interpretation of what they read and/or observed. In either case, students needed to determine the density of the wood by dividing the mass of the wood (15 g) by the volume of the wood (30 mL). The answer then had to be transferred to the numerical-response section of the answer sheet. Only 78.6% of students achieving the *standard of excellence* were successful in determining the density of the wooden dowel. Although the keyed answer is 0.50, variations of the way this could have been recorded on the answer sheet were also accepted as correct, such as 0.5, .50, .5, etc.

Reporting the Results

On August 22, 1997, each school jurisdiction received electronically a district report and individual school reports regarding their students' achievement, as well as guidelines for interpreting these results in relation to provincial standards.

To facilitate reflection on school programs, we expect that results will be shared with all school staff (not just teachers of grades 3, 6, and 9), as well as with parents and the community.

Two copies of an individual profile for each student were sent to the school that the student will attend in September. We expect that the Parent Copy be shared with parents and the School Copy will remain with the student's record.

The following achievement tests are secured:
Grade 6 Mathematics, 1995
ALL tests from 1996 and 1997

Looking Ahead: What is Upcoming for 1998

General Information

Purpose

The purpose of the Achievement Testing Program is to

- determine if students are learning what they are expected to learn
- report to Albertans how well students have achieved provincial standards at given points in their schooling
- assist schools, jurisdictions, and the province in monitoring and improving student learning

Enhance Student Learning

Careful examination and interpretation of the results can help identify areas of relative strength and weakness in student achievement. Teachers and administrators can use this information in planning and delivering relevant and effective instruction in relation to broad, general learnings in the *Program of Studies*.

Enable Accountability

Alberta Education and school jurisdiction personnel are responsible for ensuring that the highest quality education is provided to all students in the province.

Information about achievement is provided to

- schools and jurisdictions
- parents
- the public

so that they may know how well students in their schools are meeting local targets and provincial expectations.

Interpreting Results

Achievement tests assess only part of what is to be learned. In addition, many factors contribute to student achievement. Personnel at the jurisdiction and school levels are in the best position to appropriately interpret, use, and communicate jurisdiction and school results in the local context.

The Achievement Testing Program provides teachers, parents, students, school administrators, Alberta Education, and the public with information about what students know and can do in relation to provincial standards. Group results are reported at school, district, and provincial levels to improve learning opportunities for students.

The assessments are administered in two subject areas at Grade 3—language arts and mathematics—and in four subject areas at grades 6 and 9—language arts, mathematics, social studies, and science.

The assessments are based on provincial standards, which reflect important learnings in the subject areas listed above. Classroom teachers from across the province are extensively involved in developing and field testing the assessment instruments.

Administering the Tests

Information about the nature of the provincial assessments as well as their administration to special needs students can be found in the *General Information Bulletin, Achievement Testing Program,* which is mailed each fall to all superintendents and principals.

Schedule

The schedule for administering achievement tests in the 1997–98 school year is mandated.

January 1998

The January achievement Tests for Grade 9 schools on a semester system must be administered according to the following schedule

Wednesday, January 21	9:00 to 11:30 A.M.	Grade 9 English Language Arts Part A
Thursday, January 22	9:00 to 10:45 A.M.	Grade 9 Science
Friday, January 23	9:00 to 11:30 A.M.	Grade 9 Français/French Language Arts Partie A
Monday, January 26	9:00 to 10:45 A.M.	Grade 9 English Language Arts Part B
Tuesday, January 27	9:00 to 10:45 A.M.	Grade 9 Mathematics
Wednesday, January 28	9:00 to 10:45 A.M.	Grade 9 Social Studies
Thursday, January 29	9:00 to 10:45 A.M.	Grade 9 Français/French Language Arts Partie B

May 1998

The written component of the language arts achievement tests for grades 3, 6, and 9 must be administered according to the following schedule:

Tuesday, May 26	9:00 to 10:30 A.M.	Grade 3 English Language Arts Part A
	9:00 to 11:30 A.M.	Grades 6 and 9 English Language Arts Part A
Thursday, May 28	9:00 to 11:30 A.M.	Grades 6 and 9 Français/French Language Arts Partie A

June 1998

The machine-scorable component of achievement tests for grades 3, 6, and 9 must be administered according to the following schedule:

Monday, June 15	9:00 to 10:30 A.M.	Grade 3 English Language Arts Part B
	9:00 to 10:30 A.M.	Grade 6 English Language Arts Part B
Wednesday, June 17	9:00 to 10:30 A.M.	Grade 3 Mathematics
	9:00 to 10:30 A.M.	Grade 6 Mathematics
Thursday, June 18	9:00 to 10:30 A.M.	Grade 6 Social Studies
	9:00 to 10:45 A.M.	Grade 9 Français/French Language Arts Partie B
Friday, June 19	9:00 to 10:45 A.M.	Grade 9 Science
Monday, June 22	9:00 to 10:30 A.M.	Grade 6 Science
	9:00 to 10:45 A.M.	Grade 9 English Language Arts Part B
Tuesday, June 23	9:00 to 10:30 A.M.	Grade 6 Français/French Language Arts Partie B
	9:00 to 10:45 A.M.	Grade 9 Mathematics
Wednesday, June 24	9:00 to 10:45 A.M.	Grade 9 Social Studies

The tests that will be administered each year are:

Grade 3
English Language Arts (*Part A: Writing* and *Part B: Reading*)
Mathematics (English and French forms)

Grade 6
English Language Arts (*Part A: Writing* and *Part B: Reading*)
Français/French Language Arts (*Partie A: Production écrite* and *Partie B: Lecture*)
Mathematics (English and French forms)
Science (English and French forms)
Social Studies (English and French forms)

Grade 9
English Language Arts (*Part A: Writing* and *Part B: Reading*)
Français/French Language Arts (*Partie A: Production écrite* and *Partie B: Lecture*)
Mathematics (English and French forms)
Science (English and French forms)
Social Studies (English and French forms)

Students in French Programs

All students in French programs must write English Language Arts, French Language Arts, and French versions of other achievement tests if their language of instruction is French. Alberta Education will send a checklist to schools in January requesting an indication of how many English or French tests are required. These forms must be returned through jurisdiction offices by mid-February.

Marking Achievement Tests Locally

Teachers are able to mark the tests before returning them to Alberta Education. Teachers can use the results as part of an individual student's year end assessment, as well as for planning instruction.

Standards: Curriculum, Assessment, Achievement

The move toward results-based curricula has re-emphasized the need for a clear delineation of standards and their purpose. All standards and all methods of setting standards require judgement. Local targets are also discussed in this section.

> The process of setting a standard can only be as good as the judgements that go into it. The standard will depend on whose judgements are involved in the process. In this sense, all standards are subjective. Yet once a standard has been set, the decisions based on it can be made objectively. Instead of a separate set of judgements for each test-taker, you will have the same set of judgements applied to all test-takers. Standards cannot be objectively determined, but they can be objectively applied.[1]

Definitions

The Achievement Testing Program is directly concerned with three different but related standards. These provincial standards are curriculum standards, assessment standards, and achievement standards.

- **Curriculum Standards** are the expected student learnings sequenced into grade levels. They include broad statements of knowledge, skills and attitude expectations against which student performance is judged. These standards are established in the process of curriculum development and are found in the *Program of Studies* document produced for each subject.

[1] Passing Scores; Samuel A. Livingston, Michael J. Zieky; Educational Testing Service, 1982

- **Assessment Standards** are the criteria adopted for judging actual student achievement relative to curriculum standards. They are ultimately expressed and applied to test scores. They are derived from answers to questions such as: What scores must a student obtain or how many questions on a given test must a student answer correctly in order for his/her performance on the test to be judged as acceptable or excellent?

- **Achievement Standards** are judgements that specify what percentages of students are expected to achieve an acceptable and an excellent level of performance in relation to each course of studies; i.e., the relevant curriculum standards. They reflect a community judgement about what is an appropriate expectation for students. It is important to point out that this judgement is not a prediction of the percentage of students who will actually achieve acceptable or excellent levels of performance, but rather a specification of the percentage of students at a given grade or year in school who are *expected* to achieve the acceptable (85%) or excellent standard (15%). **The 85% of students expected to meet the *acceptable standard* includes those students who meet the *standard of excellence*.** These standards apply to school, jurisdiction, and provincial performance.

- **Local targets** are goals set in schools/districts to focus plans for helping students learn what is expected by the provincial government. These local targets reflect the specific needs of students, the views of teachers, school administration, and the local community, and the resources available to provide learning opportunities for students.

Confirming Standards

Confirming standards is a process in which some teachers who are selected for marking are asked to make judgements about the achievement test to answer the question of whether province-wide performance is good enough. For more information on the confirming standards process, refer to Appendix A of the *Achievement Testing Program Provincial Report, June 1993 Administration*. For information on the selection of teachers for participation in the confirming standards process, refer to the current *General Information Bulletin, Achievement Testing Program.*

Purpose of Assessment Standards

The provincial standards are the basis upon which we assess how well students have learned science by the end of Grade 9. These standards reflect the essential learnings that all Alberta students are expected to achieve. Provincial standards are useful, therefore, for assessing Grade 9 students in all types of school programs—public, private, and home education. By comparing actual results to provincial standards, decisions can be made about whether achievement is in fact "good enough."

Description of the Science Assessment Standards

The following statements describe what is expected of Grade 9 students who are meeting the *acceptable standard* or the *standard of excellence* on independent work at the end of the Grade 9 Science program. The statements represent the standards against which student achievement will be measured.

Acceptable Standard

For students to meet the *acceptable standard* of performance in Grade 9 Science, they are expected to have a basic understanding of the conceptual and procedural knowledge that is essential to the Junior High science program. For example, they can easily apply concepts and basic procedures in simple and familiar situations in which they have had previous experience, but they are challenged when applying these concepts and procedures to unfamiliar or complex situations. Students may be able to identify the name of an organism in a classification system, for example, but have difficulty interpreting the relationship of organisms at the same classification level.

To meet the *acceptable standard*, students are expected to know how to apply higher level thinking skills in familiar situations. However, students may have difficulty applying these skills in new or unfamiliar situations. For example, they can predict the effects of linking a familiar and identical electrical load in series or parallel circuit, but may have difficulty predicting the effects of linking different or unfamiliar types of electrical loads in these circuits. They can use basic skills to show what they know and can do in novel real-life problems that are simple or that require single-step solutions. Also, they can apply more advanced skills or follow multi-step procedures to solve familiar real-life problems in which they have had prior experience. For example, in a problem-solving activity to find the best insulating material, these students will be able to develop a simple and controlled procedure, collect a set of data, and determine the best insulator. However, their procedures will likely not have more than one manipulated variable and may lack a complete and logical explanation of results.

Students who meet the *acceptable standard* generally have a positive attitude toward learning about the world in which they live. They appreciate how science and technology affect them on a day-to-day basis. They are skilled in using the basic procedures of science inquiry, technological problem-solving, and societal decision-making; however, they have difficulty with the application of more advanced skills and have limited ability to make connections between science, technology, and society.

Standard of Excellence

Most students who meet the *standard of excellence* in Grade 9 Science have an exceptional understanding of the conceptual and procedural knowledge outlined in the *Program of Studies*. They can quickly and confidently apply this knowledge in complex and novel situations. For example, not only can they identify the abiotic factors that affect the health and distribution of living things, they also can predict the possible outcomes of changing abiotic factors on living things and evaluate their effects on the quality of the environment.

These students are expected to be able to apply higher-level thinking skills to unfamiliar situations. In addition, they can easily and quickly solve problems that they have direct experience with and that require single-step or multistep solutions. These students can solve a problem in more than one way and can see more than one solution for some problems. For example, not only are they familiar with the basic operation of an electric motor, but they can troubleshoot an inoperative motor, make design changes to meet varying performance criteria, and construct a working motor. Their problem-solving approach may involve more than one manipulated variable and include logical explanations of procedures and results.

Students meeting the *standard of excellence* have a positive attitude about science and its role in their world. They are curious, open-minded, creative, and confident. In addition, they are persistent problem-solvers and have the ability to view a situation from a number of perspectives. Not only do they have a high level of awareness and understanding of how science and technology affect them personally, they can translate this understanding and awareness to societal issues. They are skilled in using the basic procedures of science inquiry, technological problem solving, and societal decision making. They can successfully use advanced skills and make connections between science, technology, and society.

Grade 9 Science Assessment

General Description

The Grade 9 Science test consists of 55 machine-scored questions: 50 multiple-choice questions each with a value of one mark and 5 numerical-response questions each with a value of one mark. The five numerical-response questions are integrated with the multiple-choice questions throughout the test.

Students record their answers on a separate answer sheet.

The assessment is designed to be completed in 75 minutes. However, additional time of up to 30 minutes may be provided to allow students to finish. We suggest that those students who finish writing before one hour has elapsed remain at their desks to review their answers.

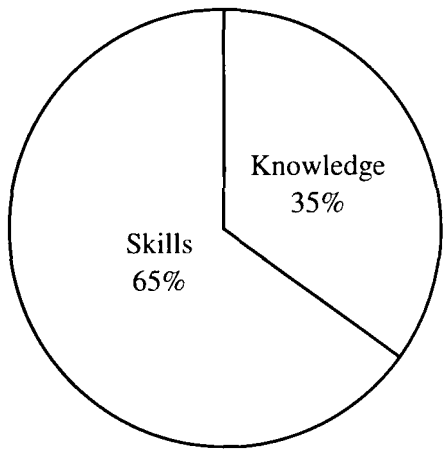
Students will need HB pencils, erasers, and a calculator.

Reporting Categories

This assessment is based on science learnings within which the nature of science, of science and technology, and of science, technology, and society are integrated components.

Knowledge is the fundamental understanding of concepts and processes of science. Skills refer to the application of knowledge.

The weighting for each of these reporting categories is shown in the following circle graph:



The skills reporting category consists of:

- inquiry skills
- technological problem-solving skills
- societal decision-making skills

The knowledge reporting category includes content from the following topics:

Diversity of Living Things
Fluids and Pressure
Heat Energy: Transfer and Conservation
Electromagnetic Systems
Chemical Properties and Changes
Environmental Quality

Blueprint

The emphasis for each topic and the knowledge and skills reporting categories are presented in the blueprint. The blueprint for the 1998 test will remain the same as it was for the 1997 test.

Blueprint
Grade 9 Science Assessment

Topic	Reporting Category Emphasis By Number of Questions* (%)		Total Number of Questions (%)
	Knowledge	Skills	
Diversity of Living Things	4 (7)	6 (11)	10 (18)
Fluids and Pressure	3 (6)	7 (13)	10 (19)
Heat Energy: Transfer and Conservation	3 (6)	4 (7)	7 (13)
Electromagnetic Systems	3 (5)	6 (11)	9 (16)
Chemical Properties and Changes	3 (6)	6 (11)	9 (17)
Environmental Quality	3 (5)	7 (12)	10 (17)
Total	19 (35)	55 (100)	36 (65)

* The number of questions on the test may vary slightly from those indicated in the reporting category.

Sample Instruction Page for Numerical-Response Questions

Instructions

- Read the question carefully.
- Write your answer in the boxes on the answer sheet, beginning in the left-hand box. Then, carefully fill in the circles that match your answer.
- Use only an HB pencil. If you wish to change an answer, **erase** your first answer **completely**.

Examples

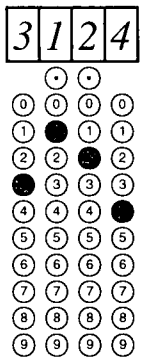
1. Red litmus paper was used to indicate whether four solutions found in a kitchen were acidic or basic. The results are shown in the table below.

Solution	Colour of Litmus Paper
1	pink
2	no change
3	red
4	blue

Record the order of the solutions from **most** acidic to **most** basic.

Answer: 3 1 2 4

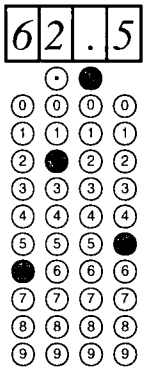
Record 3124 on the answer sheet →



2. A mechanic used a hydraulic press to compress a spring. If the hydraulic press exerts a pressure of 50.0 N/cm^2 and the surface area of the spring is 1.25 cm^2, the force exerted on the spring is _____ N (newtons).

Answer: 62.5 N (newtons)

Record 62.5 on the answer sheet →

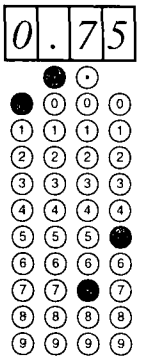


3. A block of wood is floating in a pan of distilled water. If ¼ of the block remains out of the water, the block has a specific gravity of _____.

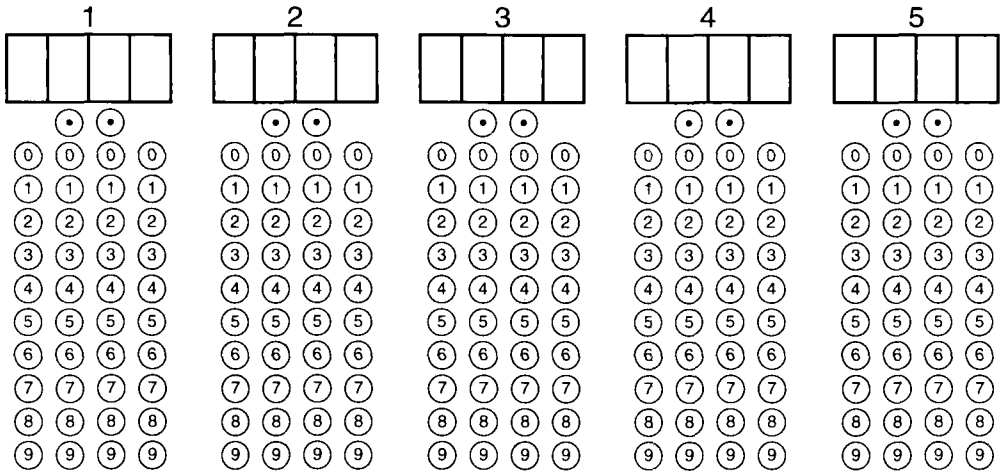
Round your answer to the nearest hundredth (two decimal places).

Answer: 0.75

Record 0.75 on the answer sheet →



Practice Answer Form for Numerical-Response Questions



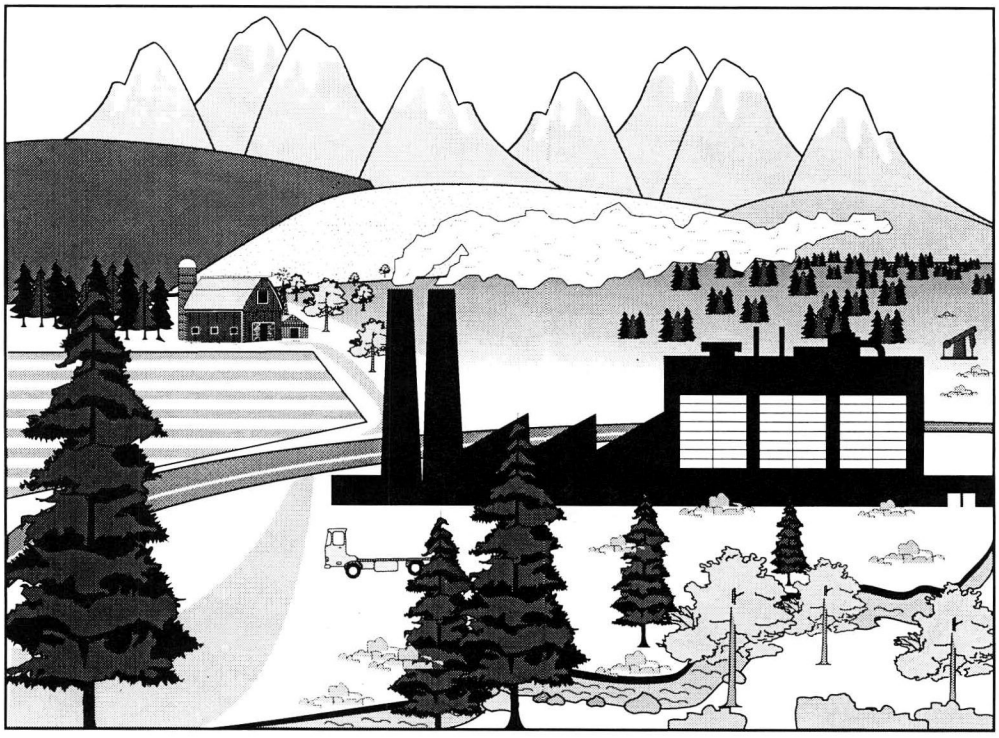
Practice Questions

The following practice questions reflect the nature and complexity of the questions that will appear on the Grade 9 Science Achievement Test.

We encourage teachers to familiarize students with the assessment by having them work through these practice questions. A practice answer sheet for the numerical-response questions is provided above so that students can familiarize themselves with this format. This collection of practice questions has been used on previous achievement tests and may be used with students. Other items from previous tests remain secured (see *General Information Bulletin*). The questions do not necessarily represent the assessment emphasis as presented in the blueprint.

There are 9 multiple-choice questions and one numerical-response question. The key and descriptors for the practice questions is found on page 28. For further practice with the various types of numerical-response questions, refer to the 1995–96 and 1996–97 Grade 9 Science information bulletins.

A FERTILIZER PRODUCTION PLANT



A fertilizer production plant uses natural gas to manufacture fertilizer. The plant released a report that explained how they will reduce sulphur oxide emissions from their smokestacks. The plant has easy access to water because it is constructed close to an agricultural region that uses an irrigation system dependent on nearby rivers, canals, and lakes. The following three questions are related to the Fertilizer Production Plant.

1. Emissions from the plant include sulphur oxides. These chemicals combine with water vapour in the air to form an acid. The word equation for this reaction is

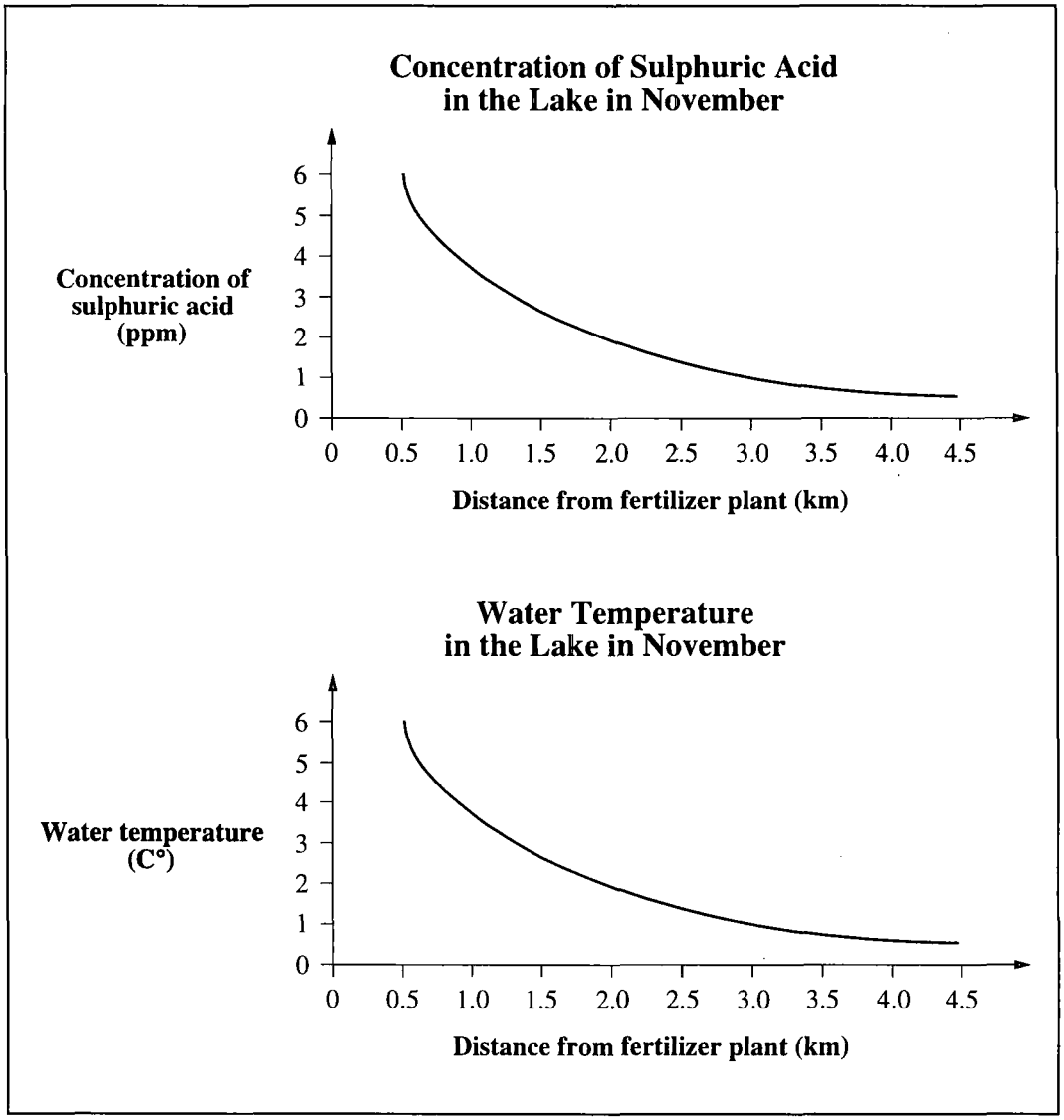
A. water + sulphuric acid → sulphur oxides

B. sulphuric acid → water + sulphur oxides

C. water + sulphur oxides → sulphuric acid

D. water + air → sulphuric acid

Use the following additional information to answer question 2.

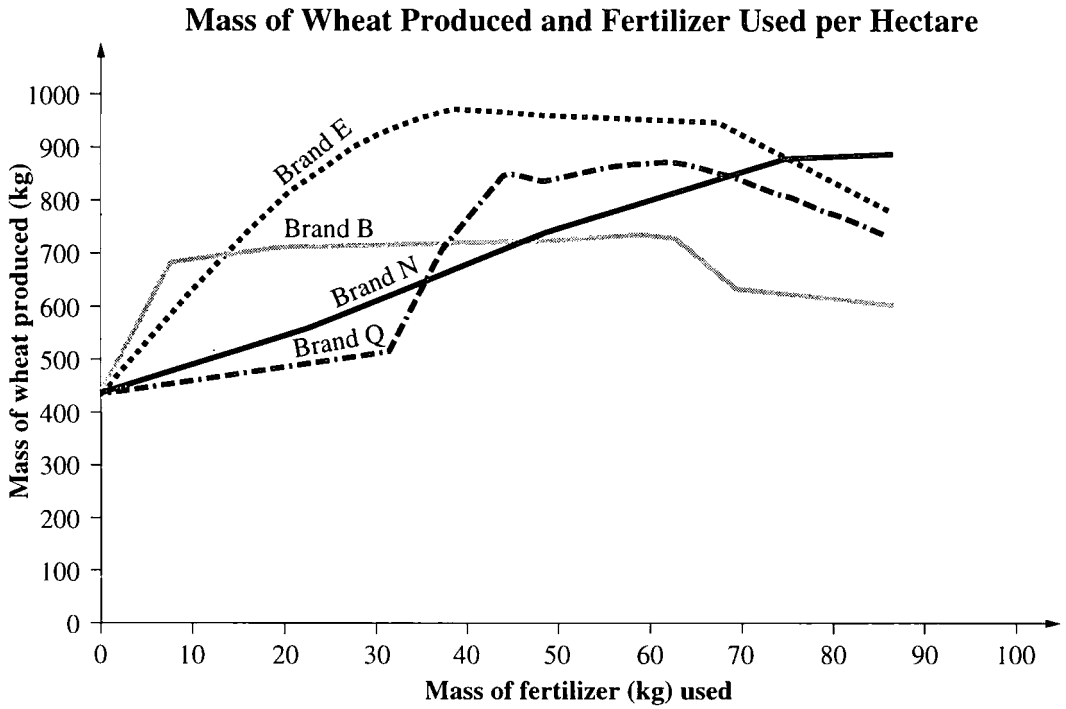


2. Residents of a lake close to the fertilizer plant reported that their boat hoists corrode more rapidly than boat hoists farther away. The information in the graphs supports the inference that greater corrosion occurs in

A. colder water with higher acidity
B. warmer water with lower acidity
C. colder water with lower acidity
D. warmer water with higher acidity

Use the following additional information to answer question 3.

The plant shared results of four new brands of fertilizer with local farmers. The following graph shows the relationship between the brand of fertilizer used on a field of wheat and the mass of wheat produced.



3. The **best** inference that can be made from the graph is that as the amount of fertilizer used

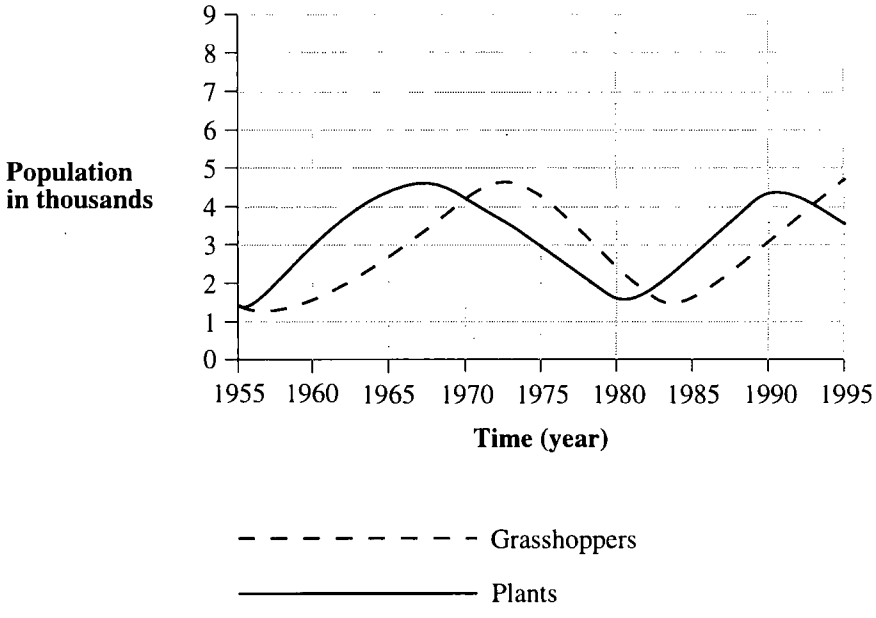
A. decreases, the rate of wheat production decreases
B. increases, the rate of wheat production remains constant
C. decreases, the rate of wheat production is not affected
D. increases, the rate of wheat production increases

NEW HOME AND AREA

The Brown family purchased a farm that is near a wildlife sanctuary. The next two questions are about their activities.

Use the following information to answer question 4.

When Kayla and Kelsey Brown visit the sanctuary, they learn that grasshoppers are a food source for several bird species in the sanctuary. Kayla studies the following graph, which shows a relationship between grasshopper and plant populations in the area.

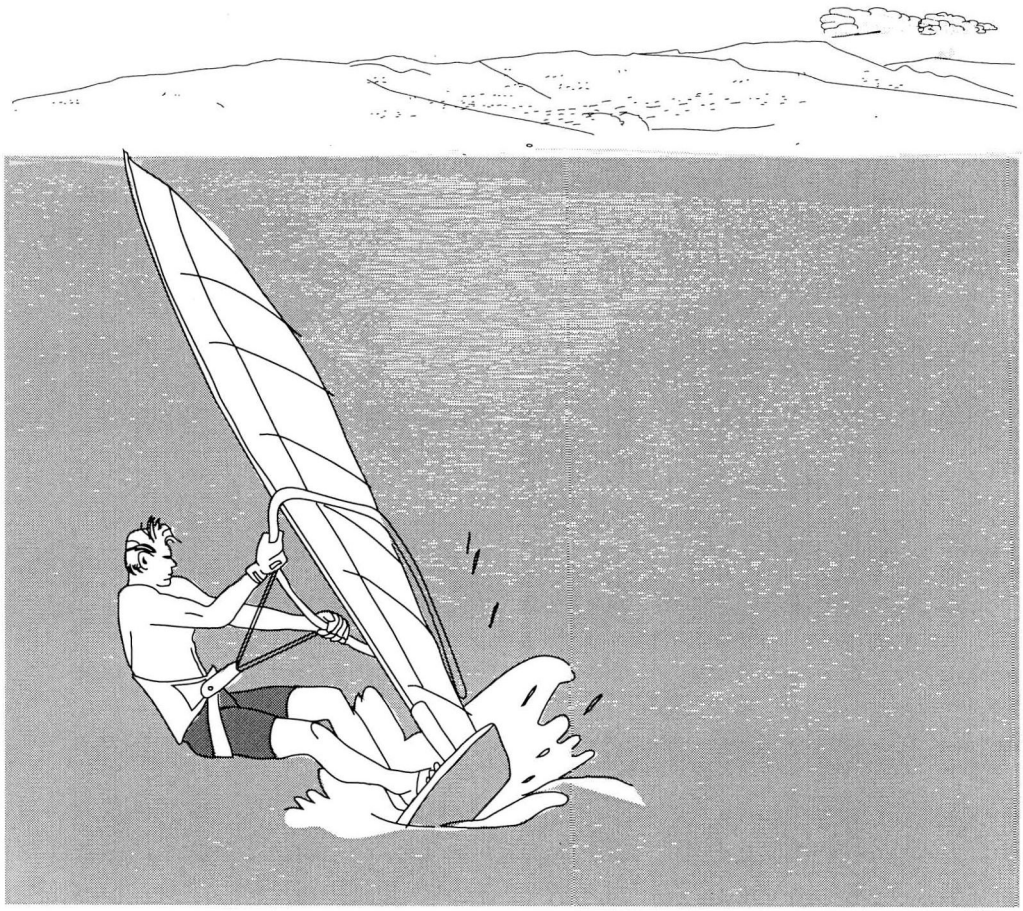


4. According to this graph, which of the following statements is **not** correct?

A. The grasshopper population is affected by the plant populations.
B. The plant populations are affected by the grasshopper population.
C. If there were no grasshoppers, the plant populations would increase.
D. If there were no plants, the grasshopper population would increase.

Use the following information to answer question 5.

Kelsey Brown went wind surfing on the ocean last year. While wind surfing on a lake near their new home, he notices that he can't go as fast as he could on the ocean.



5. Because wind speed and wave action are the same on the lake as on the ocean, the difference in speed is **most likely** due to the

A. ocean water exerting a greater buoyant force than the lake
B. greater force of gravity on the lake
C. lake water exerting a greater buoyant force than the ocean
D. greater force of gravity on the ocean

RESEARCHER

Mai Lee is a researcher who works as a consultant. She performs experiments, tests mineral ores, conducts research on waterways, and writes reports on her findings. The next three questions are about Mai Lee's work.

Use the following information to answer question 6.

As part of an analysis on a gold nugget, Mai Lee found that the nugget had a mass of 579 g and a volume of 30 cm^3. From reference sources, she found that

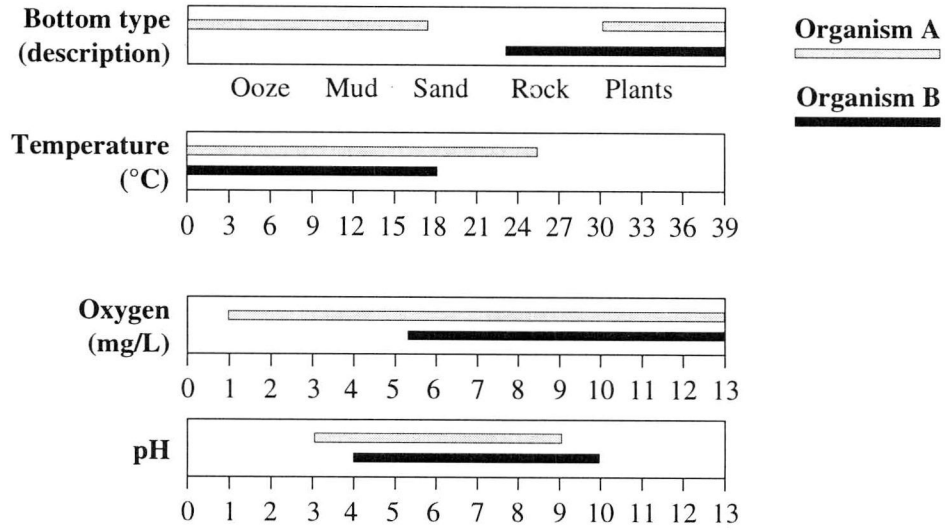
- pure gold has a density of 19.3 g/cm^3
- pure gold sells for $25.00 per gram

6. From her investigation, Mai Lee determined that

A. the nugget is pure gold and contains less than $14 000.00 worth of gold
B. the nugget is pure gold and contains more than $14 000.00 worth of gold
C. the nugget is not pure gold
D. she needed more information

Use the following information to answer question 7.

The information below shows the ability of two different organisms to survive in their environment.



At another study site, Mai Lee obtained the following data regarding the river bottom.

Temperature	18°C
Bottom type	Mud
Oxygen level	4 mg/L
pH level	10

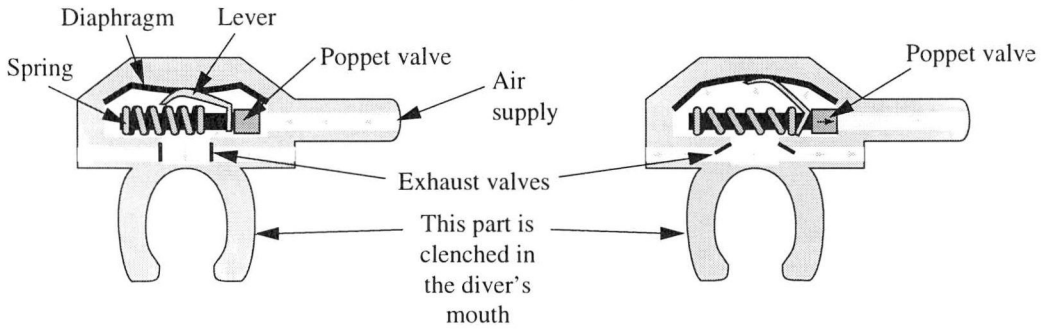
7. Which factors would prevent organism B from surviving at this study site?

A. Bottom type and pH level
B. Temperature and oxygen level
C. Bottom type and oxygen level
D. Temperature and pH level

Use the following information to answer question 8.

Mai Lee researched diving equipment for the purpose of studying the river bottom. She discovered the following information about this equipment.

Scuba Mouthpiece



8. As the diver inhales, the function of the poppet valve is to

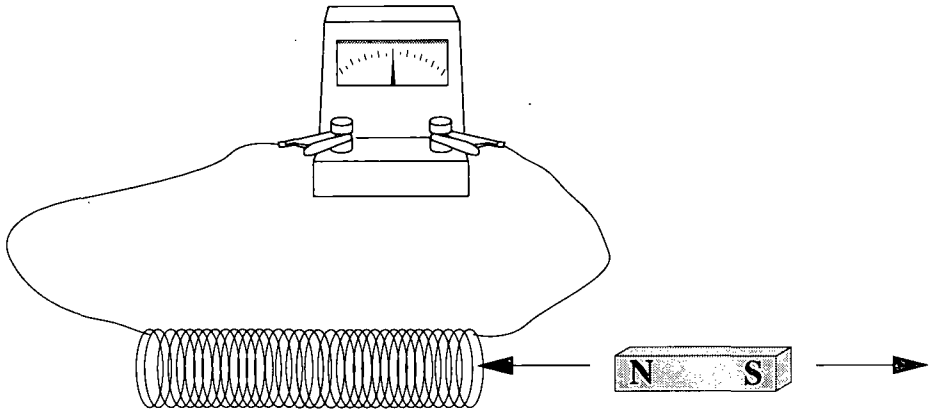
A. prevent water from entering the mouthpiece
B. prevent air from flowing in from the tank
C. allow air to enter the diver's mouthpiece
D. allow air to exit the diver's mouthpiece

SCIENCE AND TECHNOLOGY

Students from Graceland Meadows Junior High were assigned to a special project in which they were to investigate the application of science knowledge. To do this, the students performed experiments in the school lab and watched an electrician at work. The next question is about their experience.

Use the following information to answer question 9.

Amanda demonstrated a problem caused by using magnets near computer equipment. She designed a model by repeatedly inserting a magnet into a coil and then removing it. As she increased the speed of the magnet's movement back and forth, the needle on the meter first moved to the left.



9. The concept that Amanda demonstrated is the same as that used in

A. a generator
B. a thermostat
C. a thermocouple
D. an electrolyte cell

Use the following information to answer numerical-response question 1.

Shannon used displacement to calculate the density of a wooden dowel. The mass of the dowel was 15 g. The volume was calculated by submerging the dowel in a graduated cylinder containing 50 mL of water.

Numerical Response

1. The density of the wooden dowel, to the **nearest hundredth** or to **two decimal places**, is _____ g/cm^3.

RECORD YOUR ANSWER IN THE NUMERICAL-RESPONSE SECTION OF THE ANSWER SHEET

Key and Descriptors for Practice Questions

Item	Key	Reporting Category	Topic	Curriculum Standard
1	C	Chemical Properties and Changes	Knowledge	Recognize the word equation of a chemical reaction
2	D	Chemical Properties and Changes	Skill	Interpret graphs to infer the factors that affect rates of corrosion
3	D	Environmental Quality	Skill	Infer the relationship between variables represented on a graph
4	D	Diversity of Living Things	Skill	Interpret a graph to predict the effects on the relationship between two variables
5	A	Fluids and Pressure	Knowledge	Recognize the factors that affect the rate at which an object moves through a liquid
6	B	Fluids and Pressure	Skill	Determine the density of material using mass and volume
7	C	Environmental Quality	Skill	Interpret information presented in charts and graphs
8	C	Fluids and Pressure	Skill	Interpret the function of a valve
9	A	Electromagnetic Systems	Knowledge	Know that electricity can be produced by moving a magnet through a coil
NR1	0.50	Fluids and Pressure	Skill	Calculate density of a material based on mass and volume displacement

Preparing Students for the Test

We hope that teachers share the following information with their students to help them prepare for the science test.

- Talk with your students about some of the positive and negative aspects of taking tests. Share some of your own experiences and have your students share theirs.

- Familiarize your students with the format of the achievement test and the kinds of questions that will appear on it by having them work through the sample questions.

Suggestions for Answering Multiple-Choice and Numerical-Response Questions

Students should use information given for answering questions by:

—reading the information and thinking carefully about it before trying to answer any of the questions that need the information OR

—reading the questions first and then reading the information, keeping in mind the questions they need to answer

When information is given for more than one question, students should go back to the information before answering each question.

Students should make sure they look at all forms of information given. Information may be given in words, charts, pictures, graphs, and maps.

Students should choose the answer they think is best. If they don't see a correct or best answer right away, they are encouraged to find the two choices that seem closest to the correct answer and pick one of them for the answer.

For further suggestions, see *Teaching Students with Learning Disabilities*, Alberta Education, Special Education Branch pages LD 122 to 124.

Interim Policy: Use of Calculators on Alberta Education Achievement Tests

September 1997

Rationale

Recent changes in the program of study for mathematics require students to become familiar with the use of a calculator in order to complete complex computations or verify solutions to problems. The increased availability of technology in schools helps students to solve complex, real-life multistep problems.

Questions on future Grade 9 Mathematics Achievement tests will include real-life problems involving more than a single step. Students will need to use a scientific calculator when writing the Grade 9 Mathematics Achievement Test; trigonometric tables are **not** provided. Tests are constructed to ensure that the use of particular models of calculators neither advantages nor disadvantages individual students.

Definition

This policy considers a scientific calculator to be a handheld device designed for complex mathematical computations. Included in this definition are those calculators having the capabilities of performing calculations involving square root, sine, cosine, and tangent. Calculators that have more sophisticated features such as graphing capabilities, built-in formulas, mathematical functions, or other programmable capabilities are included in this definition, but are not required in Grade 9 Mathematics.

Policy

Grade 9: To ensure equity and fairness for all students and compatibility with the provincial *Program of Studies*, Alberta Education **expects** students to use scientific calculators, as defined above, when writing the Grade 9 Mathematics Achievement Test.

Grade 6: Those Grade 6 students for whom the four-function calculator is a familiar classroom tool **are encouraged, but not required**, to use a calculator when writing the Grade 6 Mathematics Achievement Test.

Grade 3: From their early years in school, students are expected to become increasingly familiar with calculators and confident in using them to solve problems. Nevertheless, students need to have mastered basic addition facts (to 18), subtraction facts (to 18), and multiplication facts (to 49). To respect this principle as well as the problem-solving nature of the new curriculum, there will be two components to the Grade 3 Mathematics Achievement Test. Those students for whom the four-function calculator is a familiar classroom tool **are encouraged, but not required**, to use a calculator when writing the multiple-choice component of the Grade 3 Mathematics Achievement Test; however, they **shall not** use calculators when writing the Timed Number Facts component of the test.

Procedures

1. Teachers must, at the beginning of the Grade 9 year, advise students that a scientific calculator is **required** when writing achievement tests in mathematics.

2. Grade 9 students should be thoroughly familiar with the calculator that they will use when writing the Grade 9 Achievement Test.

3. Although a scientific calculator is not specifically required in Grade 9 science, it may be used by students when writing the Grade 9 Science Achievement Test.

4. Teachers must also advise students of the types of information that can be stored in calculators that are brought into achievement tests.

5. Calculators that have built-in notes (definitions or explanations in alpha notation) that cannot be cleared are not permitted.

6. Students must not bring to the test external devices that support calculators. Such devices include manuals, printed or electronic cards, printers, memory expansion chips or cards, external keyboards, or any annotations outlining operational procedures for scientific calculators.

7. The type of calculator that Grade 6 students use when writing achievement tests should be consistent with their skills and abilities. A scientific calculator is neither required nor recommended for Grade 6 students.

8. In preparation for calculator failure, students may bring extra calculators and batteries into the test room. The school may also provide extra calculators and batteries.

9. During tests, supervising teachers must ensure that
   - all calculators operate in silent mode
   - students do not share calculators or the information contained within them
   - calculator cases are stored on the floor throughout the test
   - all test rules are followed

10. If you have any questions or comments about this interim policy, please contact Kay Melville, Mathematics Assessment Specialist, Achievement Testing Unit, Student Evaluation Branch, at 403-427-0010 or FAX 403-422-3206.